

Appl. No. 09/847,554

Amdt. Dated December 18, 2003

Reply to Office Action of September 25, 2003

AMENDMENTS TO THE CLAIMS

1. (Currently amended) An RF-actuated microelectromechanical systems (MEMS) switch module, comprising:

a)-an antenna for receiving an externally-generated RF control signal, and providing an antenna output signal representative thereof;

b)-a receiver ~~means~~-operatively connected to said antenna for receiving said antenna output signal and generating a DC voltage representative thereof; and

c)-a MEMS switch element having a control voltage port connected to said receiver ~~means~~-and at least two switching ports operable upon application of said DC voltage to said control voltage port;

whereby said at least two switching ports of said MEMS ~~switches~~-switch element are actuated when said externally-generated RF control signal is received at said antenna.

2. (Currently amended) The RF-actuated MEMS switch module, as recited in claim 1, wherein said receiver ~~means~~-comprises:

i)-a tuned circuit operatively connected to said antenna and having an input port for receiving said antenna output signal, wherein said tuned circuit and said antenna form a circuit substantially resonant at said RF control signal, said tuned circuit providing a tuned circuit output signal; and

ii)-a detector ~~means~~-operatively connected to said tuned circuit to receive said tuned circuit output signal and to generate ~~a~~-said DC voltage representative thereof.

3 (Original) The RF-actuated MEMS switch module, as recited in claim 2, wherein said tuned circuit is tuned to a frequency related to said externally-generated RF control signal.

4. (Currently amended) The RF-actuated MEMS switch module, as recited in claim 1, wherein said MEMS switch element is bi-stable, whereby said at least two switching ports are alternately ~~connectable~~-connected to and disconnected from one another upon application of said externally-generated RF control signal.

Appl. No. 09/847,554

Amdt. Dated December 18, 2003

Reply to Office Action of September 25, 2003

5. (Currently amended) The RF-actuated MEMS switch module, as recited in claim 1, further comprising:

d)-a capacitor operatively connected between said control voltage port and a fixed reference voltage.

6. (Original) The RF-actuated MEMS switch module, as recited in claim 5, wherein said fixed reference voltage is ground potential.

7. (Currently amended) The RF-actuated MEMS switch module, as recited in claim 2, further comprising:

e)-encapsulating material substantially completely surrounding said antenna, said tuned circuit, said detector, and said MEMS switch element, said at least two switching ports being presented outside said encapsulating material.

8. (Original) The RF-actuated MEMS switch module, as recited in claim 7, wherein said encapsulating material is opaque.

9. (Original) The RF-actuated MEMS switch module, as recited in claim 4, wherein said MEMS module is connected to an active microwave antenna element.

10. (Original) The RF-actuated MEMS switch module, as recited in claim 4, wherein said MEMS module is connected to a passive microwave antenna element.

11. (Original) The RF-actuated MEMS switch module, as recited in claim 7, wherein said MEMS module forms part of a multi-layer printed circuit structure.

12. (Original) The RF-actuated MEMS switch module, as recited in claim 1, wherein said externally-generated RF control signal comprises an RF signal having a wavelength of approximately one millimeter.

13. (Currently amended) An RF-actuated microelectromechanical systems (MEMS) switch module, comprising:

Appl. No. 09/847,554

Amdt. Dated December 18, 2003

Reply to Office Action of September 25, 2003

e) a MEMS switch element having at least two switching ports alternately connectable one to the other upon application of a control voltage at a control voltage port of said MEMS switch;

b) an antenna for receiving an externally-generated RF control signal having a predetermined frequency, and providing an antenna output signal representative thereof, said antenna being tuned to said predetermined frequency;

e) a tuned circuit operatively connected to said antenna and having an input port for receiving said antenna output signal and, in cooperation with said antenna, providing a circuit substantially resonant at a frequency related to said predetermined frequency of said RF control signal, said tuned circuit providing a tuned circuit output signal; and

d) a detector ~~means~~ operatively connected to said tuned circuit for receiving said tuned circuit output signal and generating a DC voltage representative thereof, said detector ~~means~~ also being operatively connected to said control voltage port of said MEMS switch;

whereby said two switching ports of said MEMS switch element are alternately connected to and disconnected from one another when said externally-generated RF control signal is received at said antenna.

14. (Currently amended) The RF-actuated MEMS switch module, as recited in claim 13, further comprising:

e) a capacitor operatively connected between said control voltage port and a fixed reference voltage.

15. (Original) The RF-actuated MEMS switch module, as recited in claim 14, wherein said fixed reference voltage is ground potential.

16. (Currently amended) The RF-actuated MEMS switch module, as recited in claim 13, further comprising:

Appl. No. 09/847,554

Amdt. Dated December 18, 2003

Reply to Office Action of September 25, 2003

e)-encapsulating material substantially completely surrounding said antenna, said tuned circuit, said detector, and said MEMS switch element, said at least two switching ports being presented outside said encapsulating material.

17. (Original) The RF-actuated MEMS switch module, as recited in claim 16, wherein said MEMS switch module is included within a multi-layer printed circuit structure.

18. (Original) A selectively changeable radio frequency (RF) element, comprising: at least two RF sub-elements electrically connectable to one another by an RF-actuated MEMS switch, said RF-actuated MEMS switch receiving an RF control signal at a predetermined frequency and, in response thereto, selectively connecting said at least two sub-elements.

19. (Original) The selectively changeable RF element as recited in claim 18, wherein said RF element forms part of at least one antenna structure from the group: antenna element, antenna segment, frequency-selective surface (FSS), artificial dielectric, and frequency-selective volume (FSV).

20. (Currently amended) The selectively changeable RF element as recited in claim 19, wherein said RF-actuated MEMS switch comprises at least two RF-actuated MEMS devices adapted to respond to RF actuating signals at least two or more different frequencies.